Amendments to the specification

Please amend paragraph [0002] as follows:

[0002] The present invention relates, in general, to spacer grids used in nuclear reactor fuel assemblies to place and support a plurality of longitudinal fuel rods in the reactor fuel assemblies and, more particularly, to a spacer grid for pressurized water reactor fuel assemblies, which has a grid spring at a central portion of each unit strip ~~cell wall~~ of perimeter strips so that the grid springs of the perimeter strips are in equiangular ~~conformal~~ surface contact with the fuel rods in a pressurized water reactor fuel assembly, thus reducing fretting corrosion of the fuel rods, and which has both guide vanes and guide taps on upper edges of some unit strips ~~cell walls~~ of the perimeter strips that are required to guide cross flows of the coolant in the reactor fuel assembly, thus maintaining desired intensity of cross flows of the coolant in the reactor fuel assembly and improving the thermal redundancy of the spacer grid.

Please amend paragraph [0013] as follows:

[0013] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a spacer grid for nuclear reactor fuel assemblies, which has a grid spring at a central portion of each unit strip ~~cell wall~~ of perimeter strips thereof so that the grid springs of the perimeter strips are in equiangular ~~conformal~~ surface contact with longitudinal fuel rods in a nuclear reactor fuel assembly, different from the conventional spacer grids, thus reducing fretting corrosion of the fuel rods, and which is provided, on an upper edge of some unit strips ~~cell walls~~ of the perimeter strips, with both a

guide vane to enhance the intensity of cross flows of the coolant passing through the spacer grid and a guide tap free from disturbing the cross flows of the coolant, thus improving the thermal redundancy of the spacer grid, due to the enhanced cross flows of the coolant.

Please amend paragraph [0014] as follows:

[0014] In conventional spacer grids for nuclear reactor fuel assemblies, the grid springs and dimples of the inner and perimeter strips are in non-equiangular ~~conformal~~ surface contact or linear contact with fuel rods, so that the fuel rods may slide or move relative to the grid springs and dimples at the contact surfaces thereof, thus causing the fretting corrosion of the fuel rods in the reactor core. Therefore, to prevent the fretting corrosion of the fuel rods in the reactor core, the grid springs and dimples of the inner and perimeter strips must be designed to be in equiangular ~~conformal~~ surface contact with the fuel rods. However, due to a geometrical limit, it is very difficult to manufacture the shape of the grid springs, which are provided on unit corner ~~cell walls~~ strips of the perimeter strips defining the outermost corner cells of a spacer grid, such that the grid springs establish the equiangular ~~conformal~~ surface contact with neighboring fuel rods. Therefore, in the present invention, the entire grid springs of the perimeter strips of the spacer grid are designed such that a central part of each of the grid springs, at which the grid spring is in contact with a fuel rod, has a design capable of establishing the equiangular ~~conformal~~ surface contact with the fuel rod, and the remaining part of the grid spring at which the grid spring supports an external load has a simple beam shape.

Please amend paragraph [0015] as follows:

[0015] Furthermore, when the guide vanes, which are provided on the upper edges of the perimeter strips to guide the flows of the coolant in an effort to improve the fuel rod cooling efficiency of the reactor fuel assembly, are arranged in the same manner in the entire outermost cells of the spacer grid, the cross flows of the coolant in the reactor fuel assembly may be disturbed by the guide vanes provided in some outermost cells. In the above state, the object of improving the thermal redundancy of the spacer grid by generating the cross flows of the coolant between neighboring fuel assemblies is beyond a design purpose, due to the guide vanes disturbing the cross flows of the coolant. Therefore, in the present invention, some unit strips ~~cell walls~~ of the perimeter strips which define some outermost cells required to guide the cross flows of the coolant to neighboring fuel rods are designed to have guide vanes capable of guiding the cross flows of the coolant, and the remaining unit strips ~~cell walls~~ of the perimeter strips which define the remaining outermost cells free from the function of guiding the cross flows of the coolant are designed to have only the guide taps without the guide vanes. Therefore, the spacer grid of the present invention reduces interference between the fuel rods and the spacer grid during an insertion or removal of the fuel rods into or from the reactor core.

Please amend paragraph [0020] as follows:

[0020] FIG. 3A is an elevation of an inner strip of a conventional spacer grid for nuclear reactor fuel assemblies, with an inner cell spring provided on each unit strip ~~cell wall~~ of the inner strip, according to a second embodiment of the

related art;

Please amend paragraph [0025] as follows:

[0025] FIG. 6 is a perspective view showing an inside surface of a unit strip ~~cell wall~~ constituting an inner strip of the spacer grid of FIG. 4, with an inner cell grid spring provided on the unit strip ~~cell wall~~ to establish equiangular ~~conformal~~ surface contact between a fuel rod and the unit strip ~~cell wall~~ in an inner cell and to enlarge an elastic range of the unit strip ~~cell wall~~;

Please amend paragraph [0026] as follows:

[0026] FIG. 7A is a perspective view showing an inside surface of a unit intermediate ~~cell wall~~ strip constituting the perimeter strips of the spacer grid of FIG. 4, with an outer cell grid spring, a guide vane and a guide tap provided on the unit intermediate ~~cell wall~~ strip;

Please amend paragraph [0027] as follows:

[0027] FIG. 7B is a perspective view showing an outside surface of a unit corner ~~cell wall~~ strip constituting the perimeter strips of the spacer grid of FIG. 4, with an outer cell grid spring and a guide tap provided on the unit corner ~~cell wall~~ strip;

Please amend paragraph [0028] as follows:

[0028] FIG. 8 is a perspective view of each of the perimeter strips of the spacer grid of FIG. 4, with the outer cell grid springs provided on the unit strips ~~cell walls~~ of the perimeter strip;

Please amend paragraph [0033] as follows:

[0033] The spacer grid for nuclear reactor fuel assemblies according to the present invention is used in the reactor fuel assembly 101 of FIG. 1. Particularly, the spacer grid of the present invention is preferably used in a pressurized water reactor fuel assembly. As shown in FIGS. 4, 5A, 5B, 7A and 7B, the spacer grid of the present invention designated by the reference numeral 10 includes a plurality of perimeter strips (40) each of which is fabricated with a plurality of unit intermediate ~~cell walls~~ strips 40' and unit corner strips ~~cell walls~~ 40". The perimeter strips 40 encircle the intersecting inner strips 30. The unit corner strips ~~cell walls~~ 40" form the outermost corner cells of the spacer grid 10. Throughout this application, the unit intermediate ~~cell walls~~ strips 40' and the unit corner ~~cell walls~~ strips 40" may be referred to briefly, i.e. as the unit strip ~~cell walls~~ 40' and 40" respectively, for convenience. The perimeter strips 40 have a grid spring 50 on each of the unit intermediate ~~cell walls~~ strips 40' and the unit corner ~~cell walls~~ strips 40" thereof. The grid spring 50 is designed to be equiangular ~~conformal~~ with a longitudinal fuel rod 125, so that the grid spring 50 is in equiangular ~~conformal~~ surface contact with the fuel rod 125, and to effectively support the maximum load, and to accomplish the soundness of the reactor fuel assembly. In the perimeter strips 40, each of the unit intermediate ~~cell walls~~ strips 40' has both a coolant flow guide vane 57 and a guide tap 58, while each of the unit corner ~~cell walls~~ strips 40" has either the guide vane 57 or the guide tap 58.

Please amend paragraph [0035] as follows:

[0035] FIG. 6 is a perspective view showing an inside surface of

a unit strip ~~cell wall~~ 30' of inner strip 30 constituting the inner cells of the spacer grid 10, with the inner cell grid spring 20 provided on the unit strip ~~cell wall~~ 30' to establish equiangular ~~conformal~~ surface contact between a fuel rod 125 and the unit strip ~~cell wall~~ 30' in the inner cell of the spacer grid 10. As shown in FIG. 6, the inner cell grid spring 20 of each unit strip ~~cell wall~~ 30' of the inner strip includes a vertical support part 21 that comprises two bridges extending from spring base parts 25 provided on the land surface of the unit strip ~~cell wall~~. The two bridges of the vertical support part 21 are bent toward a fuel rod 125, and may be diverged or converged in a direction toward the central portion of the grid spring 20. The vertical support part 21 is only bent when the grid spring 20 is loaded, thus the vertical support part 21 allows the fuel rods 125 to have a desired elastic behavior. A fuel rod support part 22 is provided at the central portion of the vertical support part 21. The fuel rod support part 22 has a conformal support surface which is specifically bent to have the same radius of curvature as that of the fuel rod 125, thus being brought into equiangular or conformal surface contact with the external surface of the fuel rod 125. That is, the conformal support surface of the fuel rod support part 22 is designed to have an optimal circular or elliptical profile, so that the conformal support surface is suitable for enlarging the surface contact area of the fuel rod support part 22 relative to the fuel rod 125, in addition to accomplishing a desired uniform contact pressure distribution and reducing the peak stress of the fuel rod support part 22. When the inner cell grid spring 20 having the above-mentioned double bridge-type simple beam structure is loaded by the fuel rod 125 to be deformed, the spring base parts 25 are initially deformed, before the fuel rod

support part 22 is deformed. Therefore, the inner cell grid spring 20 minimizes the deformation of the fuel rod support part 22. In FIG. 6, the reference numeral 27 and 29 denote a mixing blade and a dimple of the unit strip ~~cell wall~~ ~~cell wall~~ 30', respectively.

Please amend paragraph [0036]

[0036] FIG. 7A is a perspective view showing an inside surface of the unit intermediate ~~cell wall~~ strip 40' constituting the perimeter strips 40 of the spacer grid 10 of FIG. 4, and FIG. 7B is a perspective view showing an outside surface of the unit corner ~~cell wall~~ strip 40" constituting the perimeter strips 40 of the spacer grid 10. As shown in FIGS. 7A and 7B, the above-mentioned design of the inner cell grid springs 20 is adapted to the perimeter strips of the present invention. That is, the double bridge-type simple beam structure of the inner cell grid springs 20 is remodeled into a single bridge-type structure, thus producing the outer cell grid spring 50 which is used in the perimeter strips of the spacer grid 10 of FIG. 4. Due to the single bridge-type outer cell grid spring 50, the spacer grid 10 efficiently supports the fuel rods 125 in the outermost cells thereof including the outermost corner cells which have a narrow width, with the grid springs 50 of the outermost corner cells being in equiangular ~~conformal~~ surface contact with the fuel rods 125. To form the single bridge-type outer cell grid spring 50 on each of the unit strips ~~cell walls~~ 40' and 40" of the perimeter strips 40 according to the present invention, a vertical opening 53 is formed at the central area of each unit strip ~~cell wall~~ 40', 40" of the perimeter strips 40, with a vertical support part 51 comprising a single bridge extending vertically between the central portions of the top and bottom

edges of the vertical opening 53. The vertical support part 51 is bent at two steps. A fuel rod support part 52 is provided at the central portion of the vertical support part 51. The fuel rod support part 52 has a conformal support surface which is specifically bent to have an outward rounded cross-section with the same radius of curvature as that of the fuel rod 125, thus being brought into <u>equiangular</u> ~~conformal~~ surface contact with the external surface of the fuel rod 125. Such a conformal support surface of the fuel rod support part 52 is suitable for accomplishing a desired uniform contact pressure distribution of the fuel rod support part 52. In the present invention, the <u>equiangular</u> ~~conformal~~ surface contact of the outer cell grid spring 50 with the fuel rod 125 means that the contact surfaces of the grid spring 50 and the fuel rod 125 are rounded in the same direction so that the centers of curvature of the contact surfaces of the grid spring 50 and the fuel rod 125 are placed at the same side of the contact surfaces. However, when two contact surfaces are in contact with each other, with the centers of curvature of the two contact surfaces being placed at opposite sides of the contact surfaces, the contact is so-called a "non-equiangular contact" ~~or non-conformal contact~~.

Please amend paragraph [0037] as follows:

[0037] Furthermore, because the outer cells of the spacer grid 10 must endure the cross flows of the coolant which are originated from neighboring coolant channels and/or the internal structures of the nuclear reactor, the outer cell grid springs 50 provided on the perimeter strips must be designed such that the outer cell grid springs 50 efficiently support the maximum load which is higher than the maximum load imposed on the inner cell grid springs 20, and have the spring strength higher than

the spring strength of the inner cell grid springs 20. Therefore, the strength of the vertical support part 51 must be optimally determined to allow the outer cell grid springs 50 to efficiently endure the higher maximum load applied thereto, and the spring strength of the outer cell grid springs 50 must be optimally determined to allow the outer cell grid springs 50 to efficiently support the fuel rods 125 even when an excessive load is applied to the fuel rods 125 due to intensive cross flows of the coolant in the reactor fuel assembly. In a brief description, the fuel rod support parts 52 of the outer cell grid springs 50 provided on the perimeter strips of the spacer grid 10 are designed to be in equiangular ~~conformal~~ surface contact with the fuel rods 125, in the same manner as the inner cell grid springs 20 of the inner strips.

Please amend paragraph [0038] as follows:

[0038] As best seen in FIG. 8, each of the plurality of perimeter strips, comprising the unit intermediate ~~cell walls~~ strips 40' and the unit corner ~~cell walls 40"~~ strips 40”, includes the outer cell grid springs 50 which are in equiangular ~~conformal~~ surface contact with the fuel rods 125. Each of the perimeter strips further has the guide vane 57 and the guide taps 58 which are alternately arranged along the upper edge of the perimeter strip. The guide vanes 57 guide the flows of the coolant in the reactor fuel assembly, and the guide taps 58 reduce interference between the fuel rods 125 and the spacer grid 10 during an insertion or removal of the fuel rods 125 into or from the reactor core. The guide vanes 57 of the perimeter strips are the guide blades to guide the flows of the coolant to neighboring coolant channels, without disturbing the cross flows of the coolant which are originated from the mixing blades 27 of

the inner strips. To allow the fuel rods 125 to be inserted into or removed from the reactor core without interference between the spacer grid 10 and the fuel rods 125, the guide vanes 57 and the guide taps 58 are alternately arranged along the upper edge of the perimeter strip. The guide taps 58 are also arranged along the lower edge of the perimeter strip at positions corresponding to the positions of the guide vanes 57 and the guide taps 58 of the upper edge, thus the guide taps 58 of the lower edge efficiently guide the fuel rods 125 while eliminating the interference between the spacer grid 10 and the fuel rods 125, during the insertion or removal of the fuel rods 125 into or from the reactor core.

Please amend paragraph [0044] as follows:

[0044] As described above, in the conventional spacer grids for nuclear reactor fuel assemblies, the grid springs of the inner and outer cells are in non-equiangular ~~or non-conformal~~ surface contact or linear contact with the fuel rods, thus causing damage to the fuel rods due to fretting corrosion, when the grid springs are deformed by loads applied from the fuel rods thereto. In an effort to overcome the fretting corrosion of the fuel rods, double bridge-type grid springs designed to be in <u>equiangular</u> ~~conformal~~ surface contact with the fuel rods have been proposed. However, the double bridge-type grid springs capable of being in <u>equiangular</u> ~~conformal~~ surface contact with the fuel rods are adapted to only the inner strips which intersect each other to define the inner cells, but are not adapted to perimeter strips which define the outermost cells of the spacer grid, due to geometric limit of the double bridge-type structure of the grid springs.

Please amend paragraph [0045] as follows:

[0045] However, in the present invention, the double bridge-type grid springs used in the inner cells of the conventional spacer grids are remodeled into single bridge-type grid springs which can be in equiangular ~~conformal~~ surface contact with the fuel rods in inner and outer cells of the spacer grid. Particularly, the single bridge-type grid springs are effectively used in the outermost corner cells of the spacer grid even though the outermost corner cells have a narrow width to cause the geometric limit. The single bridge-type grid springs of the present invention maintain the equiangular ~~conformal~~ surface contact shape thereof for a lengthy period, thus stably supporting the fuel rods in the reactor fuel assembly while preventing the fuel rods from sliding relative to the grid springs, and thereby preventing the fretting corrosion of the fuel rods.